

Improved Strategies for Identifying and Addressing Fodder – Deficits, in the Mid-hills of Nepal

**National Workshop
5th – 6th September, 2000**

ABSTRACTS

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**Ministry of Forests and Soil Conservation, Nepal
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Abstract 1.

RESEARCH METHODOLOGY: APPROACHES TO UNDERSTANDING FARMERS' LIVESTOCK FEED STRATEGIES AND IDENTIFYING WAYS TO IMPROVE FODDER SUPPLY THAT INVOLVE FARMER AND VILLAGE-LEVEL INITIATIVES

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Patterns of supply and demand for livestock feeds in the mid-hills of Nepal are increasingly subject to changing circumstances affecting land resources and access, farming and livestock production practices and objectives, and household circumstances. The availability of resources such as grazing and forest lands continues to decline as the extent and intensity of use of cropland increases and the introduction of improved management of remaining resources results in changed access. At the same time changes in livestock holdings towards fewer stall-fed animals, more productive breeds and more commercial orientation (for milk sales for example) continue to change demand for the amounts and quality of feeds. Changes in household structures, education and employment also alter factors of labour and cash availability for the collection or purchase of feeds. Clearly an improved understanding of the role of these various factors in the supply and demand for feeds will help to better inform the

general approaches to improving feed supplies in the mid-hills zone.

There are two distinct aspects to building an understanding of fodder supply and deficit patterns in order to identify improved feeding strategies. One aspect is the description of current fodder management practices in terms of fodder availability and periods of shortage. The second aspect involves diagnosis of fodder nutrient deficits at household and individual livestock level, in order to be able to suggest changes to enhance production. The first aspect, description of fodder availability and periods of shortage, has been fairly well covered by previous research, as described in Pande, 1997. Such studies have identified the different types of fodder available, broad quantities, quality and duration of their availability. However, analysis of this descriptive data in terms of key influencing factors determining differential household access to and use of the various resources, is less well covered by research to date.

Approaches to the description of current fodder management practices in terms of fodder availability and periods of shortage are considered, including using farmer recall, participative, and actual fodder collection measurement. The advantages and drawbacks to a range of approaches for the assessment of animal nutritional needs are also discussed, culminating in the presentation of a proposed improved diagnosis method. The experience from support to farmers' practical efforts to address fodder deficits is considered in terms of key options and constraints to increasing feed supplies.

Abstract 2

FODDER DOMESTICATION ISSUES AND USE OF POTENTIAL VEGETATION MAP IN IMPROVING FODDER PRODUCTION IN THE MID-HILLS OF NEPAL

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Fodder trees are disappearing rapidly from the natural forests of the mid-hills. There is a deficiency of feed for livestock, one of the most important components in the farming system, for most of the year. The situation is even worse during the dry season, usually before monsoon. Feed for livestock comes from various sources including natural forest. About 35% of the annual livestock feed requirement, 5-6 million tons of dry matter equivalent, are met from forage coming from the natural forests. The national forest inventory (1999) indicated that there was an annual loss of 1.3 and 2.3% of forest from Terai and Hills respectively over a 12-year period from 1978/79 to 1990/91. In addition most of the best fodder species have become rare in the natural forest. Recent studies indicate that planting of fodder trees on farmland has increased due to a shortage of feed for livestock. Planting of fodder trees on farms is an important strategy to ensure a dependable supply of fodder to compensate the increasing demand.

In the past fodder tree plantation has never been a priority of either formal or non-formal development interventions within Nepal. Practical and technical concerns have made the situation difficult for plantation and maintenance activities.

Due to rapid destruction of forests the genetic base of important fodder species has been eroded resulting in higher chances of inbreeding and contributing to a lower yield and risk of complete extinction of some very useful species. Similarly, the optimum ecological and climatic conditions for cultivation and transplantation of many important fodder species are not yet fully known. There is inadequate information on biology and propagation at the species level. Lastly, there is little knowledge on the components of interaction between fodder trees and agriculture crops planted in close proximity. All these issues need to be dealt with carefully and information extracted before it is conveyed to the tree planters so as to enable them to improve fodder production.

Considering the fact that fodder is an important element of the farming system and that farm owners raising livestock are those with the highest demand for fodder trees it can be concluded that the future of fodder trees in Nepal is on-farm plantation. This situation is also confirmed by the lesser focus of fodder tree plantation in government plantation activities. TISC will assist in making species more easily available through supporting a decentralized tree seed distribution system of good genetic material.

Different researchers, policy instruments, and institutions have described the forest vegetation of Nepal, the descriptions have been only partly overlapping in terms of forest types, but the operational descriptions were never mapped. The tree improvement and silviculture component of the natural resource management sector assistance program has synthesized the previous efforts and integrated the vegetation types into a geographic information system for Nepal. The resulting potential vegetation map can be used (among many other uses) for estimating the distribution of fodder species and for matching species with sites more accurately.

THE BIOLOGICAL BASIS OF FARMERS' EVALUATION OF TREE QUALITY IN THE EASTERN MID-HILLS OF NEPAL

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In recent years, the assumption in agricultural research and development that scientific knowledge can and should displace local knowledge and practice has been challenged by an emerging view of local knowledge as a key component of an agricultural system. This paper describes a study of the discriminatory powers of assessment by farmers and by laboratory techniques, of the nutritive value of tree fodder found in the middle hills of Nepal. The two systems of nutritive value assessment for tree fodder are described and evaluated through detailed investigation of eight types of tree fodder (one leguminous and seven non-leguminous), used to supplement crop residue-based diets for cattle during the dry season. Both systems are shown to provide means of discriminating fodder sources in terms of their nutritive value that are comparable in terms of discriminatory power and

consistency. This research suggests that laboratory assessment of the feed quality of tropical tree fodder may be used to build on and enhance rather than replace local classification.

Farmers used two distinct descriptors of tree fodder value. One (*obanopan*), appeared to relate to digestibility (as predicted by an *in vitro* test) and the other (*posilopan*), that was perceived as an indicator of general nutritional quality, appeared to relate to the ability of a tree fodder to promote the supply of protein at the duodenum. However, the relationship between *obanopan* and *in vitro* digestibility indicated that Nepalese farmers, in preferring to use *obano* fodder, also preferred less digestible fodder because of an ability to satisfy animal appetite in times of feed shortage. Interestingly, ranking of the tree fodders by a panel of nutritionists was negatively correlated with farmers' *obanopan* ranking and did not appear to account, in any way, for the *posilopan* criterion judged important by farmers. This highlights the paramount importance of interpreting nutritional information against farmers' objectives for a given set of circumstances. An initial analysis of complementarity between the information provided by farmers' perceptions of fodder quality and those generated in a laboratory would appear encouraging for a more integrated approach to assessing fodder quality for the smallholder farmer.

Abstract 4.

FEEDS AND FODDER MANAGEMENT IN THE DRY SEASON

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In the agricultural system of Nepal, livestock are enormously important not only for providing farm power, manure and animal protein but are also among the few options available to the rural communities to improve their standard of living as well as employment opportunities. At present the agricultural sector contributes over 41% to the National GDP in which the share of livestock in agricultural GDP is 31% with a potential to increase to 45%. The sector has been identified as one with potential for faster economical growth. With the realization of this fact by the national planners, due importance has been given to livestock sector development in the running 20 years Agricultural Perspective Plan.

The paper outlines how periodic deworming, scheduled vaccination, a slight improvement in available fodder and feeding systems, with regular supplementation of minerals and continuous feeding of concentrates or even grains and grain by-products can prove very effective in improving livestock productivity.

Similarly, keeping only two milking cattle or buffalo instead of today's average 4.8 heads of livestock per household will reduce the national deficit of dry matter (31%), concentrated feed (67%) and green fodder (54%) by 50%. Thereafter the overall deficit of dry matter will be 15.5%, concentrated feed deficit will be 33.5%

and the green fodder deficit will drop down to 27%. Likewise, improvement in feeds/fodder and feeding system is expected to reduce the total feed deficit by 5%.

Now the remaining deficit of dry matter (10.5%) and green fodder (22%) will be reduced gradually through the 5 years National livestock package programme by planting 10 fodder trees for each cattle or buffalo per year, compulsory utilization of fallow fields during winter, strict stall feeding to avoid free grazing in the jungle and rotational grazing and permanent pasture development on at least 10% of the total cultivated land of each family. Together these measures will eliminate the national deficit of dry matter (DM), and green fodder by the end of the 5 year National livestock production package programme.

Abstract 5.

SURVIVAL AND GROWTH OF FODDER SPECIES FROM DHADING, KABHRA AND SINDHUPALCHOK DISTRICT

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A study on "Strategies for the improved production of fodder during the dry season using participatory research techniques" was carried out jointly by HMG Nepal' s Department of Forest Research and Survey (DFRS), Nepal Agroforestry Foundation (NAF) and Natural Resource Institute (NRI) of UK since September 1997. The study concentrated on five mid-hill sites of three districts (Dhading, Sindhupalchowk, and Kavrepalanchok). Ten farmers from each site were selected to take an active part in the study. The selection of participating farmers was based on a set of criteria formulated jointly by farmers and the research team. An initial survey of farmer practices showed that farmers have certain preferences regarding fodder tree species. A total of six fodder trees were found to be preferred by the participating farmers; of which three were indigenous and three exotic.

The survival rate of planted seedlings was highest for *Guazuma ulmifolia*, an exotic fodder tree species, followed by *Artocarpus lakoocha*, *Morus alba* and *Leucaena diversifolia*. The survival of the seedlings, however, varied according to the location. The highest survival rate for *Leucaena diversifolia* was at Gajurichhap followed by the Chankubesi site. Similarly, the height attained by the seedlings was found to be varied according to the location.

Leucaena diversifolia was found to reach 62 cm, the highest among all the species planted. This was followed by *Guazuma ulmifolia*, *Bauhinia purpurea*, *Artocarpus lakoocha* and *Morus alba*.

Abstract 6.

EFFECT OF SOIL PROPERTIES ON THE SURVIVAL OF SOME FODDER TREES PLANTED IN THREE DISTRICTS IN THE MIDDLE HILLS OF NEPAL

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Field experiments were conducted at Dhading, Kabhre and Sindhupalchok Districts, to develop improved strategies for fodder production in the middle hills of Nepal. Impact of soil properties on the survival of *Artocarpus lakoocha* (Badahar), *Morus alba* (Kimbu) and *Leucaena divesifolia* K-156 (Ipil-Ipil) raised on the terraces of the bari land in five Village Development Committee (VDC), were assessed. Measurements were made for soil properties and survival per cent of the seedlings in each research plot.

The per cent of textural separates of sand, silt and clay present in the soils of five VDCs were significantly different (Sig. level 0.000), however, they were very much the same within a VDC. The contents of total nitrogen, total organic carbon, available phosphorus and exchangeable potassium varied greatly across the VDCs. The amount of Nitrogen, organic carbon and clay per cent also varied within the VDC. Strong correlation were seen between pH and P ($r=-0.8251$), pH and Clay ($r= 0.5617$), N and Sand ($r=-0.6269$), N and Silt ($r= 0.6294$), C and N ($r=0.8971$), C and Sand ($r=-0.5557$), C and Silt ($r=0.5999$), P and K ($r=0.6134$), and P and Silt ($r=-0.6446$).

The survival per cent of the three fodder species planted on the terraces were appreciably different across the VDCs (Sig. Level: Badahar 0.0729; Ipil-Ipil 0.0082; Kimbu 0.069). Ipil-Ipil had the highest survival percentage (84%). It was followed by Kimbu (82%) and Badahar (78%). There was a strong correlation between survival per cent of Badahar and Ipil-Ipil rate ($r=0.93$) but no such correlation were seen between Kimbu and Ipil or Badahar and Kimbu.

The effect of some soil properties on the survival per cent of the fodder seedling were significant. The survival per cent of Badahar increased with the increase in pH ($r=0.88$), C ($r=0.93$), N ($r=0.98$), silt ($r=0.86$) and clay per cent ($r=0.83$). Similarly increase in the survival of Ipil was observed as the pH ($r=0.87$), and clay per cent ($r=0.60$) increased. Survival per cent of Kimbu remained unaffected by change in pH but it increased with the increase in C ($r=0.53$), sand ($r=0.52$), silt ($r=0.052$) and clay per cent ($r=0.57$) in soil. The increase in available phosphorus, however, decreased the survival of all the species (Ipil $r=-0.71$, Kimbu $r=-0.48$, Badahar $r=-0.97$).

Abstract 7.

DESCRIPTION OF SEASONAL PATTERNS OF LIVESTOCK FEED COLLECTION AND DEFICITS DERIVED FROM SIMPLE REPEAT-VISIT SURVEY PROCEDURES FOR SMALL-HOLDER MIXED FARMS IN THE MID-HILLS ZONE IN NEPAL

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Under the DFID-funded research project 'Strategies for improved fodder production in the dry season in the mid-hills of Nepal, using participatory research techniques' a simple survey method was devised to obtain information on the seasonal collection and utilization of livestock feeds. The objectives of the survey were to describe the seasonal patterns of feed collection, deficits and allocation to different livestock, with as much quantification as possible but without complex and costly recording, weighing, and data handling procedures. At the same time the survey should involve useful discussion with farmers about feed needs at different times of year as a basis for jointly determining the requirements for additional feed resources on farms.

The survey was conducted in five villages differing in altitudes, access to cropland and forest, and proximity to markets, with 10 farmers selected during group discussions to represent the range of land and livestock holdings within each village. Survey visits

to each household were made at two-month intervals over 14 months. Each visit involved a 10-30 minute discussion with each household (with members most directly involved in feed collection and allocation), to record the current livestock holding, daily amounts of different types of feeds collected (in local measures), sources of feeds (on or off-farm), daily grazing periods, feed allocation to each type of livestock, estimated feed deficits, and current livestock production objectives and productivity. Additional single visit surveys established the land holdings, cropping patterns, on-farm tree holdings, household size, and labour constraints for fodder collection for all households.

The expected seasonal patterns of feed collection were evident, with higher collections of cut grass and grazing fodder in the rainy season and of tree fodders and crop residues in the dry season. Fodder collection was positively associated with land holdings, tree holdings and household size (labour availability), as well as with livestock holdings (though collection rates were not sufficient for the larger livestock holdings). Generally over 60% of fodder was derived on-farms, though villages differed in this respect depending on access to forests. The collection of fodders off-farm was clearly more necessary for households with larger livestock holdings but also depended on the availability of labour. Lack of access to off-farm resources reduced the amounts of fodder available for livestock. Understanding of household circumstances with regard to all factors affecting feed availability will help to define the most appropriate feed development interventions.

Abstract 8.

AN ANALYSIS OF FARMERS' DECISION-MAKING PROCESSES REGARDING FODDER MANAGEMENT STRATEGIES

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The collaborative project 'Strategies for improved fodder production in the dry season in the mid-hills of Nepal using participatory research techniques' amassed data on current fodder management practices in five sites through farmer interviews. Analysis of the data highlighted variations in management practices between farmers and between sites. These variations were discussed within site-specific farmer groups and between group representatives at a series of workshops. The discussions yielded more information on the decision-making processes that farmers employ to determine the quantity and composition of feed offered to livestock at particular times of the year. Among the influences to decisions were constraints to grazing and knowledge of appropriate lopping regimes for different fodder tree species. Varying degrees of access to off-farm fodder sources and the number of livestock kept by different households were also seen to affect fodder management decisions.

Abstract 9.

USING FUZZY SETS TO COMBINE LOCAL AND BIOLOGICAL KNOWLEDGE OF THE FEEDING VALUE OF TREE FODDER TO PREDICT THE OUTCOMES OF DIFFERENT SUPPLEMENTATION STRATEGIES

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Farmers in Nepal have a sophisticated understanding of the fodder value of different tree species and how this varies seasonally, much of which is encapsulated in two independent classification systems that they use to distinguish fodders of different utility. These farmer's classifications have also been found to correspond to biologically pertinent attributes of fodder such as protein supply and overall dry matter digestibility. Here, a model derived from these correspondences and incorporating fuzzy sets, is used to explore the utility of combining the qualitative knowledge of farmers about a wide range of tree species with quantitative scientific data and understanding. This simple example of what may be possible using these methods illustrates how potentially powerful tools for interpreting decision making by farmers in

complex domains can be generated. This approach might be more widely applied to make better use of qualitative information garnered from local people in the process of participatory rural appraisal.

Abstract 10.

DESCRIPTION OF THE COMPOSITION AND QUALITY OF LIVESTOCK DIETS DERIVED FROM SIMPLE REPEAT-VISIT SURVEY PROCEDURES FOR SMALL-HOLDER MIXED FARMS IN THE MID-HILLS ZONE IN NEPAL

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Under the DFID-funded research project 'Strategies for improved fodder production in the dry season in the mid-hills of Nepal, using participatory research techniques' a simple survey method was devised to obtain information on the seasonal collection and utilization of livestock feeds. The survey included a simple method for recording the proportions of collected fodders of each type allocated to different types of livestock (cows and calves, buffaloes, oxen and goats). These data were used to estimate the amounts, composition and quality of diets offered to livestock with a view to help determine the requirements to improve diets.

Estimation of the amounts and quality of feeds offered to livestock required additional information on the weights, dry matter (DM) and useable fodder contents of local measures of fodder collection (mainly bhari back-loads). These were obtained from sample weighing and other field experience. Estimates of nutritive values

of fodders were obtained from the literature including Crude Protein (CP), Crude Fibre (CF) and Metabolisable Energy (ME). Livestock holdings of each type were converted to adult equivalents (to include immature animals) since feeds were generally group-allocated to livestock types.

Expected seasonal differences in amounts and composition of diets were evident in the data. Estimated feed offer rates were realistic given the likely levels of refusals of offered feeds. Offer rates were highest in the rainy and early dry season and declined through the mid to late dry season. Proportions of cut grass and grazing were highest in the rainy and early dry seasons while proportions of tree fodders were highest in the dry season. Crop residues were used in cattle, oxen and buffalo diets through most of the year. Concentrate use increased in the dry season.

There were marked differences in diet composition between villages and species. Diets were similar in Gajuri Chhap and Gauthale, with lower proportions of crop residue and cut grass and higher proportions of tree fodders and grazing than other villages. Diets in Ange depended heavily on crop residues, while those in Chankhubesi and Tawari included relatively high proportions of cut grass. Buffalo diets contained higher proportions of crop residues, cut grass and tree fodders than cattle diets, while goat diets were based largely on tree fodders. Oxen grazed more than other types of livestock. Access to grazing and production objectives were also important factors determining diet composition and quality. The diet descriptions provided a useful base for discussion of requirements to improve livestock feeding.

Abstract 11.

STRATEGIES FOR COPING WITH FODDER DEFICITS IN MAKWANPUR DISTRICT, CENTRAL NEPAL

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Fodder trees are an integral component of Nepalese farming systems. This study was carried out to investigate i) status of fodder trees management on farm land (major fodder tree species and quantity that farmers have maintained; preferred fodder tree species; fodder lopping calendar); ii) main fodder deficit months and strategies adopted for solving fodder deficit in dry seasons; and iii) problems associated with fodder tree management at large. Data were collected by interviewing 30 percent of households through structured survey questionnaire in two Dairy Co-operatives Suping Dugdha Utpadak Sahakari Sanstha Ltd. and Manakamana Dugdha Utpadak Sahakari Sanstha Ltd.; of Makwanpur District in Central Nepal.

In Suping, the major fodder species were: *Saurauria nepaulensis* (Gogan)-22.79%, *Ficus nemoralis* (Dudhilo)-17.84%, *Ficus roxburghii* (Nimaro)-14.89%, and *Ficus semicordata* (Khanayo)-13.0% constituting 68.55% of all fodder trees maintained on farm land. Each household has an average of 32 fodder trees. Buffaloes and cows are the dominant livestock with an average of 3.31 livestock unit (LSU) per household. The preferred fodder species are: *Ficus roxburghii* (Nimaro), *Saurauria nepaulensis* (Gogan), *Ficus semicordata* (Khanayo), *Grewia oppositifolia* (Syalfusre), and *Ficus nemoralis* (Dudhilo). More than 80% of the farmers reported Mid March to Mid May as the most fodder

scarce period. Farmers get fodder from *Saurauria nepaulensis* (Gogan), *Ficus nemoralis* (Dudhilo), and *Litsea polyantha* (Kutmero) during this dry period. There was a significant correlation ($p=0.00$) between farm size and number of fodder trees, and also between farm size and number of livestock ($p=0.04$). Lack of seeds and seedlings of fodder trees and technical know-how about their production and propagation were the major constraints associated with the promotion of fodder trees in Suping.

In Manakamana, the three major fodder species were: *Litsea polyantha* (Kutmero)-24.74%, *Ficus semicordata* (Khanayo)-22.71%, and *Ficus hispida* (Dhungre)-20.42% constituting 67.88% of the total fodder trees maintained on private farm. Each household maintains an average of 4.51 LSU and more than double the number of fodder trees than that of Suping. *Artocarpus lakoocha* (Badahar), *Ficus hispida* (Dhungre), *Ficus* spp. (Dumri), *Ficus semicordata* (Khanayo), and *Litsea polyantha* (Kutmero) were considered as the preferred fodder trees. Farmers maintain *Ficus* spp. (Dumri), *Ficus roxburghii* (Nimaro), *Artocarpus lakoocha* (Badahar), *Ficus semicordata* (Khanayo), and *Ficus hispida* (Dhungre) for the most fodder deficit period of March to May. Problems associated with fodder tree production are the same as in Suping.

Abstract 12.

FODDER TREE AS A POTENTIAL RESOURCE OF FEED FOR LIVESTOCK IN WESTERN HILLS OF NEPAL

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A Samuhik Bhraman (a collective observation tour) was conducted by a multi-disciplinary group consisting of Animal Nutritionist, Animal Breeder, Veterinarian, Socio-economist and District Livestock Service Officer with special focus on Feed and Feeding of Livestock. The team was assigned to visit four AER (Bhakimli, Maduwa, Chhahara, Chambas) and four OR sites (Rising Patan, Ghalegaun, Barhabise, Argali) of ARS (Agricultural Research Station), Lumle representing River basin, Low hill, Mid hill and High hill. A group discussion with the local farmers was held through rapid rural appraisal (RRA) with the help of structured questionnaire.

The livestock were mainly fed with crop residues, grasses, fodder and grain depending upon the availability. From the experience of different visits, seventeen tree-fodders were identified as common tree fodder lopped between October-April. Especially during mid March and mid May, livestock face with the critical shortage of fodder. Trees such as *Artocarpus lakoocha*, *Bambusa balcooa*, *Bridela retusa*, *Premna barbata*, *Terminalia chebula*, *Litsea monopetala*, *Ficus lacor*, *Ficus semicordata*, *Machilus odoratissima*, *Morus alba* and *Ficus glaberrima* are potentially important to supply fodder during the lean period.

Abstract 13.

MITIGATING FODDER DEFICITS IN THE MID-HILLS OF NEPAL: STRATEGIES AND APPROACHES

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The livestock in Nepal face a seasonal deficit in fodder supply. During March to May this is critical whereas during mid June to October the fodder is in surplus. It is estimated that the country as a whole has a feed deficit of 20-36% (APP, 1995), the problem being more acute in the hills and mountains than in the Terai. During such period, livestock depend mainly on fodder originating from forest areas.

The Hills Leasehold Forestry and Forage Development Project (HLFFDP) has been working in ten hill districts of Nepal since 1991, with the aim of raising incomes of families below the poverty line and improving the ecological conditions in the hills by leasing blocks of degraded forest land to groups of poor households. This paper outlines strategies and approaches for improved fodder supply from both private and leasehold land in the hills based on lessons learned from this project.

While there is a significant opportunity to increase fodder supply from terrace risers and bunds and uncultivated private lands (Kharbari), the common land resources will continue to be an important source of fodder in the future. Conservation and appropriate storage of surplus fodder during September-October substantially reduces the fodder deficit during March to May. On-site farmer training and conservation tours are effective tools

to motivate farmer/groups to intensify the available land resources with appropriate fodder species, This, however, should be backed up by timely supply of appropriate planting materials and overall technical know-how related to fodder management and utilization.

Fodder supply from community forests should be promoted with improvements in accessibility of individual households for fodder collection, by certain adjustments in the present community forestry Act. Since the poorest people depend mainly on livestock for their livelihood; leasehold forestry and community forestry programs should be able to supply fodder for them.

Abstract 14

CONSTRAINTS IN THE DEVELOPMENT OF TREE FODDERS IN THE MID HILLS OF NEPAL

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Livestock is a crucial component of rural livelihoods in Nepal, contributing 31% of the total Agricultural Gross Domestic Product (AGDP) of the country. The hills in general and mid hills in particular contribute a major share of around 53% of the total AGDP, The livestock components having economic importance in this region are mainly cattle, buffalo, sheep, goat, pig, poultry, mules and rabbit. The large and small ruminants are found in almost every household in rural areas where fodder trees and crop residues are their main diet. The fodder trees are the main source of nutrition for these animals in all seasons and their importance is most felt in dry seasons when grasses and other crop residuals are either scarce or unpalatable. The farmers have traditional inherited knowledge about the fodder trees but are largely unconcerned about the value of the fodder being provided and the only parameters studied are its palatability and availability. The conscious farmer may go a step ahead in selecting a more nutritious fodder plant by long experience of production monitoring and replantation of new trees. The lack of proper knowledge and the tendency of copying old technology without appropriate timely modification is seen by the author as the constraint in the development of fodder in the hills of Nepal. The only guiding forces present in this section are Government and some Non-Government agencies whose dedication and

success is again an unanswered question

The author amassed ideas during a visit to Gulmi in 1993 and as a supervisor of veterinary fourth year students from IAAS in 2000. The tour included some potential midhill districts like Makwanpur, Dhading, Tanahu, Kaski, Syangja and Palpa where road-side villages and livestock pocket areas were targeted as the source of information. The primary and secondary data were studied to trace the constraints on the developmental pathway of these natural resources, which have traditionally been a source of nutrition for animals. The need for natural resource management and challenge to feed the increasing population presents tree fodder as a sustainable alternative source of livestock feed. Their importance however needs to be highlighted and available information disseminated to utilize this source judiciously and scientifically to get maximum benefit. Plans have to be prepared to rely on this source of nutrition to remove the stress resulted from feeding potential human food sources such as grains and concentrates. The removal of constraints in the path of fodder tree development for profitable and sustainable livestock farming is essential. The study also paved the way for the identification of constraints in the path of development of other natural resources such as herbs and other non timber forest products.

PROBLEMS AND CHALLENGES IN THE IMPLEMENTATION OF SUGGESTED IMPROVEMENTS TO FODDER MANAGEMENT STRATEGIES IN THE FIELD THROUGH LOCAL FARMERS' GROUPS

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The collaborative research project 'Strategies for improved fodder production in the dry season in the mid-hills of Nepal using participatory research techniques' is one of several projects carried out in Nepal in recent years concerned with improvements to land or natural resource management in the country. However, there has been limited measurable progress on the implementation of suggested strategic improvements in the field. However, without successful implementation the value of the work cannot be fully realised. Several issues are relevant to successful extension in this regard. It is important to avoid using detailed collated information on resource availability to develop prescriptions or timetables of management strategies for presentation to farmers. Suggestions should have inherent flexibility to take account of farmers' short-term priorities. Similarly, advice should build on farmers' current practices, rather than using information, whether or not collected in a participatory manner, to produce management formulae in a top-down method. Any new innovations should undergo trials before being presented to farmers. On-farm trials have more significance for farmers than station trials but often cannot be used to test more complex technological innovations. Farmers should share responsibility

for designing any trials on their own land. Ideally, any extension strategies used to promote recommended changes in fodder management techniques should focus on increasing farmer choice and encouraging discussion of ideas and problems through local farmer groups.